Center Innovation Fund: AFRC CIF

Leading-Edge Asynchronous Propeller Technology (LEAPTech)

Completed Technology Project (2015 - 2015)

Project Introduction

In Spring 2015, NASA and its commercial partners ran full-scale ground tests of a LEAPTech experimental wing. Called the Hybrid-Electric Integrated Systems Testbed (HEIST), this 31-foot carbon-composite wing section held 18 propeller motors powered by lithium iron phosphate batteries. Rather than incur the significant costs of testing the HEIST in a wind tunnel, the research team mounted it onto a specially modified truck that was driven across a dry lakebed at Edwards Air Force Base at 70 miles per hour, simulating takeoff speeds. The HEIST was attached to load cells on a supporting truss to dampen the effects of the road.

The ground tests provided valuable data and furthered risk reduction, positively contributing to future flight research. Specifically, the ground tests were an important step toward development of a small X-plane demonstrator. The X-plane will involve replacing a Tecnam P2006T's wings and engines with LEAPTech, allowing engineers to easily compare its performance against that of the original aircraft.

Anticipated Benefits

The LEAPTech distributed-propeller approach to electric aviation will increase efficiency 500 percent, reduce costs 30 percent, dramatically reduce aircraft noise, and produce zero emissions. It also is expected to improve the performance and ride quality of electric-propulsion aircraft. In addition, the commercial potential for this technology is significant, since approximately half of passenger air travel is short range—known as the thin-haul market—for which electric propulsion is ideal. Within a few years, such aircraft could be retrofitted to incorporate the LEAPTech propulsion system, achieving significant environment and economic benefits.

Mounted on a specially modified truck the HEIST ground-test version of LEAPTech was driven at speeds up to 70 mph across a dry lakebed at Edwards Air Force Base

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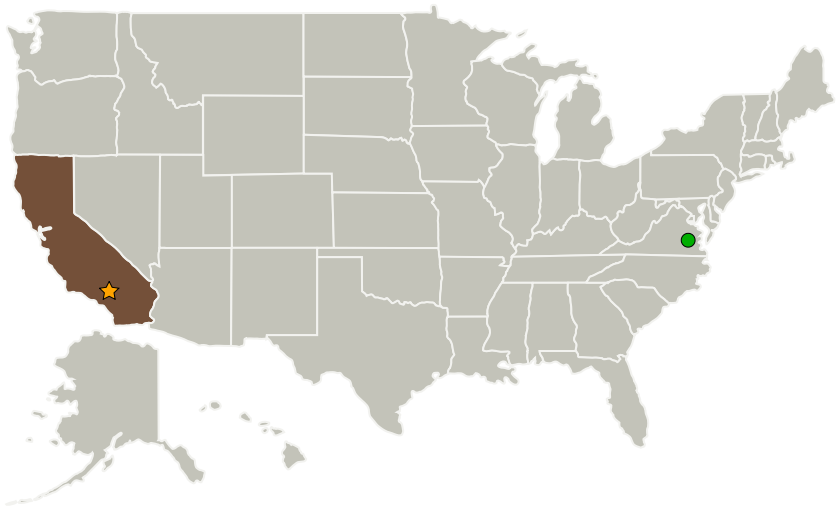
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
●Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Co-Funding Partners	Type	Location
Empirical Systems Aerospace, Inc. (ESAero)	Industry	Pismo Beach, California
Joby Aviation	Industry	

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Center Innovation Fund: AFRC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

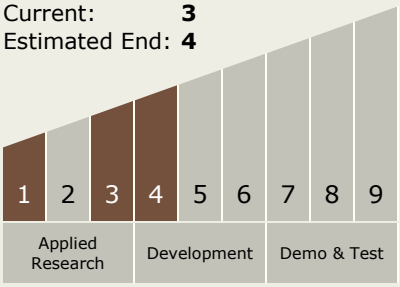
David F Voracek

Principal Investigator:

Sean C Clarke

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **4**



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Images

LEAPTech
Mounted on a specially modified truck the HEIST ground-test version of LEAPTech was driven at speeds up to 70 mph across a dry lakebed at Edwards Air Force Base *(https://techport.nasa.gov/image/16616)*

Stories

LEAPTech Success Story *(https://techport.nasa.gov/file/22079)*

NASA Closes in on Electronic Airplane *(https://techport.nasa.gov/file/21494)*

NASA Works on Electric Aircraft *(https://techport.nasa.gov/file/21493)*

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.6 Advanced Atmospheric Flight Vehicles